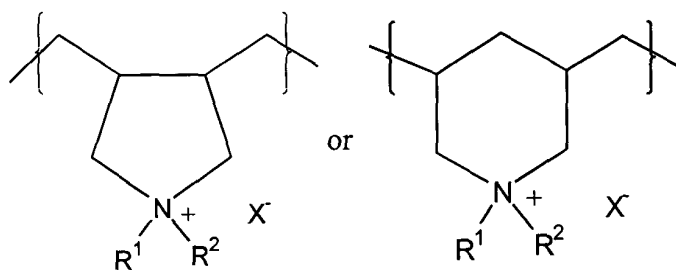


CLAIMS

What is claimed is:

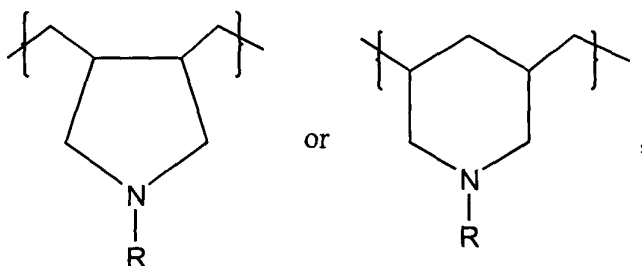
1. A method for removing bile acids from a patient comprising the step of administering to the patient a therapeutically effective amount of a poly(diallylamine) polymer wherein more than 10% of the amino nitrogen atoms are substituted by a hydrophobic substituent.
2. The method of Claim 1 wherein the polymer is a homopolymer.
3. The method of Claim 1 wherein the polymer is a copolymer.
4. The method of Claim 1 wherein the hydrophobic substituent is a normal or branched C₂-C₂₄-alkyl group.
5. The method of Claim 1 wherein the polymer comprises a repeat unit of the general formula



- wherein R² is hydrogen, a substituted or unsubstituted C₁-C₂₄-alkyl group, a substituted or unsubstituted arylalkyl group or a substituted or unsubstituted aryl group; R¹ is a substituted or unsubstituted C₃-C₂₄-alkyl group, a substituted or

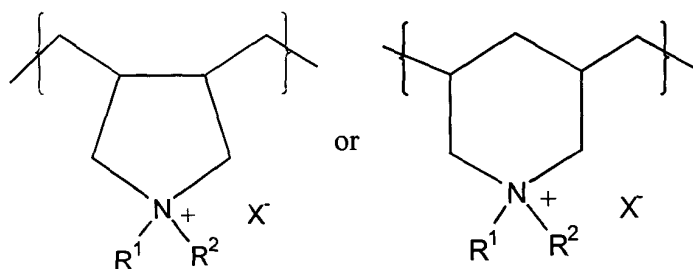
unsubstituted arylalkyl group or a substituted or unsubstituted aryl group; and X^- is a pharmaceutically acceptable anion.

6. The method of Claim 5 wherein X^- is a conjugate base of an acid selected from the group consisting of hydrochloric acid, hydrobromic acid, citric acid, tartaric acid, lactic acid, phosphoric acid, methanesulfonic acid, acetic acid, formic acid, maleic acid, fumaric acid, malic acid, succinic acid, malonic acid, sulfuric acid, L-glutamic acid, L-aspartic acid, pyruvic acid, mucic acid, benzoic acid, glucuronic acid, oxalic acid, ascorbic acid and acetylglycine.
7. The method of Claim 5 wherein R^1 is a normal or branched C_3 - C_{24} -alkyl group which is substituted by an amino group, an ammonium group, an amido group, a hydroxyl group, a sulfone group, a sulfoxide group or an alkoxy group.
8. The method of Claim 5 wherein R^1 is an alkyl group selected from the group consisting of hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl and tetradecyl.
9. The method of Claim 8 wherein R^2 is methyl and R^1 is selected from the group consisting of octyl, decyl and dodecyl.
10. The method of Claim 1 wherein the polymer is characterized by a repeat unit of the general formula



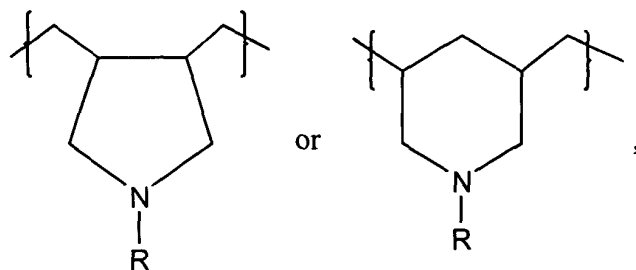
wherein R is a substituted or unsubstituted alkyl group or a substituted or unsubstituted aryl group.

11. The method of Claim 10 wherein R is a C₃-C₂₄-alkyl group.
12. The method of Claim 11 wherein the alkyl group is selected from the group consisting of hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl and tetradecyl.
13. The method of Claim 11 wherein the alkyl group is substituted by an amino group, an ammonium group, an amido group, a hydroxyl group, a sulfoxide group, a sulfone group or an alkoxy group.
- 10 14. The method of Claim 1 wherein the polymer comprises a first monomer of the general formula



- wherein R¹ is hydrogen, a substituted or unsubstituted C₁-C₂₄-alkyl group or a substituted or unsubstituted aryl group; R² is a substituted or unsubstituted C₃-C₂₄-alkyl group or a substituted or unsubstituted aryl group; and X⁻ is a pharmaceutically acceptable anion; and a second monomer of the general formula

-54-

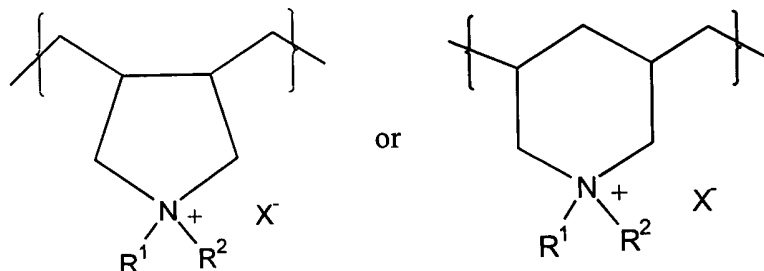


wherein R is hydrogen, a substituted or unsubstituted alkyl group or a substituted or unsubstituted aryl group.

15. The method of Claim 1 wherein the polymer is a crosslinked polymer.
- 5 16. The method of Claim 15 wherein the polymer is crosslinked by a multifunctional co-monomer.
17. The method of Claim 16 wherein the multifunctional co-monomer is selected from the group consisting of diacrylates, triacrylates, tetraacrylates, dimethacrylates, diacrylamides, dimethacrylamides, diallylacrylamides and polyvinylarenes.
- 10 18. The method of Claim 17 wherein the multifunctional comonomer is selected from the group consisting of ethylene glycol diacrylate, propylene glycol diacrylate, butylene glycol diacrylate, ethylene glycol dimethacrylate, butylene glycol dimethacrylate, methylene bis(methacrylamide), ethylene bis(acrylamide), ethylene bis(methacrylamide), ethylidene bis(acrylamide), ethylidene bis(methacrylamide),
15 bisphenol A dimethacrylate, bisphenol A diacrylate, pentaerythritol tetraacrylate, trimethylolpropane triacrylate and divinylbenzene.
19. The method of Claim 16 wherein the multifunctional comonomer is a multifunctional diallylamine.

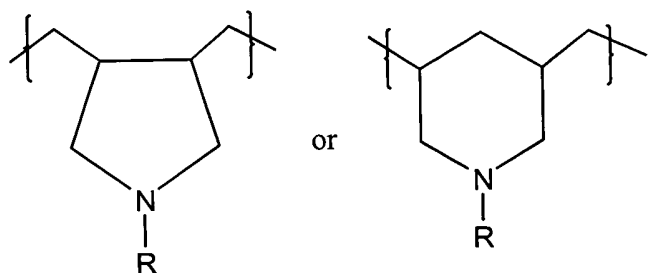
20. The method of Claim 19 wherein the multifunctional diallylamine is a bis(diallylamino)alkane or a bis(diallylalkylammonio)alkane.
21. The method of Claim 20 wherein the multifunctional diallylamine is 1,10-bis(diallylmethylammonio)decane dibromide.
- 5 22. The method of Claim 15 wherein the polymer is crosslinked by a bridging unit selected from the group consisting of straight chain or branched, substituted or unsubstituted alkylene groups, diacylalkylene groups, diacylarene groups and alkylene bis(carbamoyl) groups.
- 10 23. The method of Claim 22 wherein the bridging units are selected from the group consisting of $-(CH_2)_n-$, wherein n is an integer from about 2 to about 20; $-CH_2-CH(OH)-CH_2-$; $-C(O)CH_2CH_2C(O)-$; $-CH_2-CH(OH)-O-(CH_2)_m-O-CH(OH)-CH_2-$, wherein m is 2 to about 4; $-C(O)-(C_6H_2(COOH)_2)-C(O)-$; and $-C(O)NH(CH_2)_pNHC(O)-$, wherein p is an integer from about 2 to about 20.
- 15 24. A method for removing bile acids from a patient comprising the step of administering to the patient a therapeutically effective amount of a polymer characterized by a diallylamine monomer wherein the amino nitrogen atom is substituted with an ammonioalkyl group.

25. The method of Claim 24 wherein the polymer comprises a repeat unit of the general formula



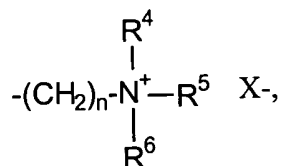
- 5 wherein R¹ is hydrogen, a substituted or unsubstituted C₁-C₂₄-alkyl group, a substituted or unsubstituted arylalkyl group or a substituted or unsubstituted aryl group; R² is an ammonioalkyl group; and X⁻ is a pharmaceutically acceptable anion.

26. The method of Claim 24 wherein the polymer is characterized by a repeat unit of the general formula



- 10 wherein R is an ammonioalkyl group.

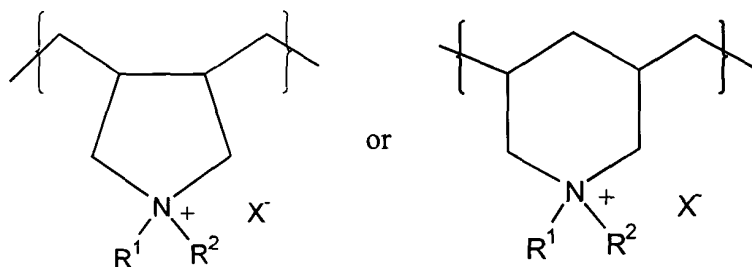
27. The method of Claim 24 wherein the ammonioalkyl group is of the general formula



wherein n is an integer from 2 to about 20, X- is an anion, and R⁴, R⁵ and R⁶ are each, independently, hydrogen or a C₁-C₂₄-alkyl group.

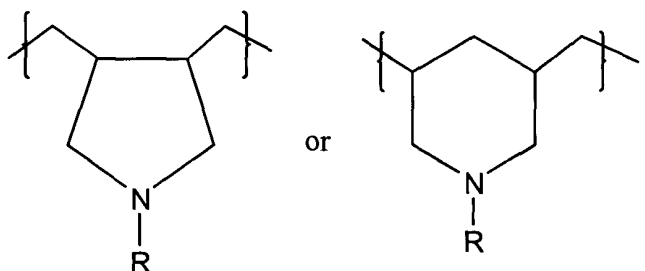
28. The method of Claim 27 wherein at least one of R⁴, R⁵ and R⁶ is a C₆-C₂₂-alkyl group.
- 5 29. The method of Claim 25 wherein the polymer comprises from about 1 mole percent to 100 mole percent of the diallylamine repeat unit having an ammonioalkyl-substituted amino nitrogen atom.
30. The method of Claim 24 wherein the polymer is crosslinked.
31. The method of Claim 30 wherein the polymer comprises a multifunctional
10 comonomer.
32. The method of Claim 31 wherein the multifunctional monomer is selected from the group consisting of diacrylates, dimethacrylates, diacrylamides, dimethacrylamides and polyvinylarenes.
33. The method of Claim 32 wherein the multifunctional comonomer is selected from
15 the group consisting of ethylene glycol diacrylate, propylene glycol diacrylate, butylene glycol diacrylate, ethylene glycol dimethacrylate, butylene glycol dimethacrylate, methylene bis(methacrylamide), ethylene bis(acrylamide), ethylene bis(methacrylamide), ethylidene bis(acrylamide), ethylidene bis(methacrylamide), bisphenol A dimethacrylate, bisphenol A diacrylate, diallylacrylamide and
20 divinylbenzene.
34. The method of Claim 30 wherein the multifunctional comonomer is a multifunctional diallylamine.

35. The method of Claim 34 wherein the multifunctional diallylamine is a bis(diallylamino)alkane or a bis(diallylalkylammonio)alkane.
36. The method of Claim 35 wherein the multifunctional diallylamine is 1,10-bis(diallylmethylammonio)decane dibromide.
- 5 37. The method of Claim 30 wherein the polymer is crosslinked by bridging units selected from the group consisting of straight chain or branched, substituted or unsubstituted alkylene groups, diacylalkylene groups, diacylarene groups and alkylene bis(carbamoyl) groups.
38. The method of Claim 37 wherein the bridging units are selected from the group consisting of $-(CH_2)_n-$, wherein n is an integer from about 2 to about 20; $-CH_2-CH(OH)-CH_2-$; $-C(O)CH_2CH_2C(O)-$; $-CH_2-CH(OH)-O-(CH_2)_n-O-CH(OH)-CH_2-$, wherein n is 2 to about 4; $-C(O)-(C_6H_2(COOH)_2)-C(O)-$; and $-C(O)NH(CH_2)_pNHC(O)-$, wherein p is an integer from about 2 to about 20.
- 10 39. A polymer characterized by a diallylamine monomer wherein the amino nitrogen atom is substituted by an ammonioalkyl substituent.
40. The polymer of Claim 39, said polymer comprising a repeat unit of the general formula



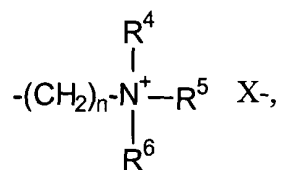
wherein R^1 is hydrogen, a substituted or unsubstituted C_1 - C_{24} -alkyl group, a substituted or unsubstituted arylalkyl group or a substituted or unsubstituted aryl group; R^2 is an ammonioalkyl group; and X^- is a pharmaceutically acceptable anion.

41. The polymer of Claim 39, said polymer being characterized by a repeat unit of the
5 general formula



wherein R is an ammonioalkyl group.

42. The polymer of Claim 39 wherein the ammonioalkyl group is of the general formula



- 10 wherein n is an integer from 2 to about 20, X^- is an anion, and R^4 , R^5 and R^6 are each, independently, hydrogen or a C_1 - C_{24} -alkyl group.

43. The polymer of Claim 42 wherein at least one of R^4 , R^5 and R^6 is a C_6 - C_{22} -alkyl group.

44. The polymer of Claim 40, said polymer comprising from about 1 mole percent to 100 mole percent of the diallylamine repeat unit having an ammonioalkyl-substituted amino nitrogen atom.
45. The polymer of Claim 40, said polymer being crosslinked.
- 5 46. The polymer of Claim 45, said polymer comprising a multifunctional comonomer.
47. The polymer of Claim 46 wherein the multifunctional monomer is selected from the group consisting of diacrylates, dimethacrylates, diacrylamides, dimethacrylamides and polyvinylarenes.
48. The polymer of Claim 47 wherein the multifunctional comonomer is selected from
10 the group consisting of ethylene glycol diacrylate, propylene glycol diacrylate, butylene glycol diacrylate, ethylene glycol dimethacrylate, butylene glycol dimethacrylate, methylene bis(methacrylamide), ethylene bis(acrylamide), ethylene bis(methacrylamide), ethylidene bis(acrylamide), ethylidene bis(methacrylamide), bisphenol A dimethacrylate, bisphenol A diacrylate, diallylacrylamide and
15 divinylbenzene.
49. The polymer of Claim 45 wherein the multifunctional comonomer is a multifunctional diallylamine.
50. The polymer of Claim 49 wherein the multifunctional diallylamine is a bis(diallylamino)alkane or a bis(diallylalkylammonio)alkane.
- 20 51. The polymer of Claim 50 wherein the multifunctional diallylamine is 1,10-bis(diallylmethylammonio)decane dibromide.

52. The polymer of Claim 45 wherein the polymer is crosslinked by bridging units selected from the group consisting of straight chain or branched, substituted or unsubstituted alkylene groups, diacylalkylene groups, diacylarene groups and alkylene bis(carbamoyl) groups.
- 5 53. The polymer of Claim 52 wherein the bridging units are selected from the group consisting of $-(CH_2)_n-$, wherein n is an integer from about 2 to about 20; $-CH_2-CH(OH)-CH_2-$; $-C(O)CH_2CH_2C(O)-$; $-CH_2-CH(OH)-O-(CH_2)_n-O-CH(OH)-CH_2-$, wherein n is 2 to about 4; $-C(O)-(C_6H_2(COOH)_2)-C(O)-$ and and
- 10 $-C(O)NH(CH_2)_pNHC(O)-$, wherein p is an integer from about 2 to about 20.
54. A method for removing bile acids from a patient comprising the step of administering to the patient a therapeutically effective amount of a crosslinked poly(diallylamine) polymer wherein more than 10% of the amino nitrogen atoms bear a C_3-C_{24} -alkyl group.
- 15 55. The method of Claim 54 wherein more than 20% of the amino nitrogen atoms bear a C_3-C_{24} -alkyl group.